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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/071,424	02/08/2002	Lieuwe Jan Spreeuwers	NL010107	1725

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EXAMINER

KRONENTHAL, CRAIG W

ART UNIT

PAPER NUMBER

2624

DATE MAILED: 05/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/071,424	Applicant(s) SPREEUWERS ET AL.	
	Examiner Craig W. Kronenthal	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 February 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12, 16 and 17 is/are rejected.
- 7) ☒ Claim(s) 13-15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed February 27, 2006, has been entered and made of record.
2. The examiner withdraws the claim objections to claims 6 and 7 for minor informalities.
3. The examiner also points out that claims 16 and 17 were rejected with the same arguments regarding claim 1. See the last sentence of the first paragraph on page 4 of the Office Action.

Response to Arguments

4. Applicant's arguments with respect to claims 1, 2, 5, 6, and 9 have been fully considered but they are not persuasive. Applicant argues in essence that Apicella does not disclose establishing a local intensity variation from data values in successive data sets in corresponding spatial positions. The examiner disagrees and indicates that Apicella's temporal difference yields a local intensity variation. The resulting dark line indicates the variation of intensity at corresponding spatial positions. The pixels belonging to the dark line indicate a change in intensity whereas the pixels in the blank areas indicate no intensity change. The examiner understands that Applicant's local intensity variation is computed differently than the reference to Apicella. However, the differences are not recited in the claim. Specifically, the claim does not disclose the use of blocks and their respective mean intensity values in computing the local intensity

variation. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

5. Applicant's arguments with respect to claim 3 have been fully considered but they are not persuasive. Applicant argues in essence that Gupta does not disclose the first partial derivative of the intensity with respect to time. The examiner disagrees and indicates that Gupta localizes the region of interest on the basis of velocity. As the applicant points out, velocity is the time derivative of position. Furthermore, it is well known in the art that the change in position is determined from a change in intensity of corresponding pixels. Therefore, the velocity incorporates the time derivative of the local intensity variation. Since Gupta discloses using velocity as a tolerance for localizing the region of interest, it can be said that Gupta teaches localizing on the basis of the time derivative of the local intensity variation.

6. Applicant's arguments with respect to claim 10 have been fully considered but they are not persuasive. Applicant argues in essence that Apicella does not teach localizing a plurality of regions of interest on the basis of a local intensity variation. The examiner disagrees and indicates that Apicella's temporal difference yields a local intensity variation of the plurality of ventricles, which are the regions of interest. The dark line forms around the plurality of ventricles (col. 4 lines 46-50). The arguments made above with respect to claim 1 are applicable to claim 10.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1, 2, 5, 6, 9, 16, and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Apicella et al. (PN 5,273,040) (hereinafter Apicella).

Regarding Claim 1: Apicella discloses a method of analyzing successive data sets (temporally adjacent images), where each of the individual data sets comprise data elements (voxels) which assign data values (intensities) to spatial positions, the method comprising the steps of (col. 4 lines 28-41):

- establishing a local intensity variation $[I(x,t)]$ from data values in successive data sets in corresponding spatial positions (col. 4 lines 35-50) [The difference image represents the variation in intensity in temporally adjacent images], and
- localizing a region of interest (dark line corresponding to cardiac movement) on the basis of the local intensity variation a region of interest is localized from one or more of the successive data sets (col. 4 lines 42-60) [The examiner interprets the absolute value of the difference image to be the localized region of interest since this image shows only voxels pertaining to the ventricle movement (col. 4 lines 56-60).], wherein the local intensity variation in the region of interest is in

conformity with a predetermined property (col. 4 lines 50-54) [The local intensity variation of the motion conforms with a preselected threshold used to limit the region of interest to only ventricle movement.]

The analogous arguments of claim 1 are applicable to claims 16 and 17.

Regarding Claim 2: Apicella discloses a method of analyzing successive data sets wherein the step of establishing the local intensity variation is carried out for respective blocks of several data elements (col. 4 lines 35-41). [The corresponding voxels of the two temporal images are subtracted to obtain the local intensity variation. Each image may be considered a block containing of several voxels.]

Regarding Claim 5: Apicella discloses a method of analyzing successive data sets further including a step of classifying data elements in one or more individual data sets (col. 3 lines 49-55 and col. 6 lines 42-44) [The voxels are classified as either representing blood or a non-blood tissue.], the classification of the data elements in the relevant data set (sets) indicating whether the relevant data element belongs to the region of interest or not (col. 6 lines 55-66) [The region growing means D uses the classification to determine which voxels are part of the region of interest, in this case the ventricles, by zeroing the voxels that are non-blood tissue voxels and keeping the blood voxels representative of the ventricles.].

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Regarding Claim 6: Apicella discloses a method of analyzing successive data sets wherein the step of classifying includes performing the classification on the basis of a measure of similarity of the local intensity variation and a reference intensity variation in the region of interest (col. 6 lines 42-54) [The voxels remaining after subtraction, and therefore representing the local intensity variation, are compared with probability curves (Figure 2, items 68 and 76), indicative of expected reference intensity variations. The comparison indicates the certainty that a voxel belongs to the blood or non-blood tissue classes.].

Regarding Claim 9: Acipella discloses a method of analyzing successive data sets wherein said successive data sets are made to correspond to one another (col. 4 lines 39-44) [The successive data sets or temporal images have corresponding voxels and are essentially identical.].

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Apicella in view of Gupta et al. (PN 6,292,683) (hereinafter Gupta).

Regarding Claim 3: Apicella does not disclose the step of localizing on the basis of a time derivative of the local intensity variation. However, Gupta discloses a method of analyzing successive data sets wherein the step of localizing includes localizing the region of interest on the basis of variations in the local intensity variation, notably on the basis of a time derivative of the local intensity variation (col. 8 lines 40-47) [The region of interest is localized by choosing the pattern that meets the tolerance requirements. The tolerance may be a predetermined velocity. Velocity is the time derivative of position and it is well known in the art that the change in position is determined from a change in intensity of corresponding pixels. Therefore, the velocity incorporates the time derivative of the local intensity variation. Since Gupta discloses using velocity as a tolerance for localizing the region of interest, it can be said that Gupta teaches localizing on the basis of the time derivative of the local intensity variation. The velocity would be determined for each pattern and only those patterns meeting the tolerance requirements belong to the region of interest.]. It would have been obvious to one of ordinary skill in the art to modify Apicella to localize the absolute value of the difference by taking the time derivative and setting a threshold to remove motion that doesn't meet the velocity requirements. This modification would have been obvious because Gupta performs this thresholding on a motion image obtained by differencing as done by Apicella. Although Gupta uses a reference pattern image and a temporal image, as opposed to Apicella's two temporal images, the subtraction is still between two images of the same object.

Furthermore, Apicella addresses the need to threshold the difference image (col. 4 lines 50-54), which is the purpose for Gupta's performing the time derivative.

11. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Apicella.

Regarding Claim 4: Apicella discloses a method of analyzing successive data sets wherein the step of localizing the region of interest includes localizing blocks of data elements in which the variations in the local intensity variation are larger than a predetermined ceiling value and/or by localizing blocks of data elements in which the variations in the local intensity variation are smaller than a predetermined bottom value (col. 4 lines 50-55). Apicella doesn't expressly disclose a ceiling value and a bottom value, however, Apicella sets small values to zero and other values to one, so it would have been obvious to use a bottom value to determine what values are small and likewise to use a ceiling value to determine what values should be assigned to one.

12. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Acipella in view of Geiser et al. (PN 5,360,006) (hereinafter Geiser).

Regarding Claim 7: Acipella discloses a method of analyzing successive data sets and classifying data elements but does not disclose using a mean intensity variation in determining the classification. However, Geiser discloses a method of analyzing medical images wherein the step of classifying includes performing the classification on

the basis of a correlation of the local intensity (intensity value of each pixel) with a mean (average) intensity in the region of interest (col. 16 lines 6-12). It would have been obvious to one of ordinary skill in the art to modify Acipella's method of classifying variations with Geiser's use of the mean intensity of the region to yield a method of classification that correlates the local intensity variation with the mean intensity variation. Furthermore, one would have been motivated to make this modification to allow for automated classification independent of a priori information.

13. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Apicella in view of Doi et al. (PN 5,343,390). (hereinafter Doi)

Regarding Claim 8: Apicella discloses a method of analyzing successive data sets as claimed in claim 1, but does not disclose masking the data values based on spatial gradients. However, Doi discloses an automated method for selecting a region of interest from medical images including a step of masking parts with spatial gradients of data values in individual data sets in as far as the modulus of the spatial gradients in the relevant parts exceeds a predetermined acceptable gradient modulus (col. 8 lines 19-24). [Doi discloses an edge gradient analysis in which gradient values of blocks within an image are compared with a predetermined threshold to mask the region of interest. It would have been obvious to one of ordinary skill in the art to modify Acipella with Doi because Doi teaches the importance of eliminating sharp edges in MR imaging. Furthermore one of ordinary skill in the art would have been motivated to eliminate

sharp edges to reduce the number of falsely identified regions of interest due to temporary gradients. In addition, Acipella acknowledges the use of a voxel's gradient in determining classification (col. 2 lines 18-19).

14. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Apicella in view of Suri (PN 6,718,055).

Regarding Claim 10: Apicella discloses a method of analyzing successive data sets, comprising the steps of:

- Localizing a plurality of regions of interest on the basis of a local intensity variation, wherein the local intensity variation in said regions of interest being in conformity with a predetermined property (col. 4 lines 42-60) [The examiner interprets the absolute value of the difference image to be the localized region of interest since this image shows only voxels pertaining to the ventricle movement (col. 4 lines 56-60). The local intensity variation of the motion conforms with a preselected threshold used to limit the region of interest to only ventricle movement (col. 4 lines 50-54).].

Apicella does not disclose obtaining the MIPs or obtaining a feature image from differencing MIPs. However, Suri teaches a medical imaging system for:

- Determining maximum intensity projections (MIPs) for the respective regions of interest (col. 12 lines 33-35) [For each pixel location throughout the sequence a

maximum intensity value is computed thereby forming a maximum intensity projection.], and

- Forming a feature image from differences between said maximum intensity projections (col. 12 lines 31-33) [Difference images are formed.]

It would have been obvious to one of ordinary skill in the art to modify Apicella with the teaching of Suri to difference MIP images because both teach automatic methods of determining a region of interest, specifically in the area of the myocardium, from medical images. Furthermore, one would have been motivated to incorporate Suri's MIPs into Apicella's method of detecting a region of interest because the use of MIPs aids in identifying the dominant structure, which in this case is the region of interest.

Regarding Claim 11: Apicella discloses a method of analyzing successive data sets wherein a center of the region of interest is determined in the feature image (col. 4 lines 66-68) [The center of mass means (Figure 1A, item 30) determines a geometric center of the heart.].

15. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Apicella in view of Suri as applied to claim 11 above, and further in view of Geiser.

Regarding Claim 12: Acipella discloses a method of analyzing successive data sets wherein

- A boundary of the region of interest is localized [Acipella uses an edge operator routine (Figure 1B, item 110) to determine the edges of each ventricle which are the region of interest (col. 8 lines 5-9).]

Apicella does not disclose transforming the feature image to pole-coordinates before determining the edges. However, Geiser discloses a method wherein:

- The feature image is transformed to pole-coordinates (col. 16 lines 46-50) with said center as the origin (col. 11 lines 53-54). [Geiser doesn't expressly disclose the transforming of a feature image into pole-coordinates such that the center is at the origin, however it is obvious to one of ordinary skill in the art that the same origin used for the elliptical filter would be the origin used for the search region.]

It would have been obvious to one of ordinary skill in the art to modify Apicella edge detection to operate with pole-coordinates as taught by Geiser. One would have been motivated to make this modification because of the elliptical shape of the region of interest.

Allowable Subject Matter

16. Claims 13-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

17. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

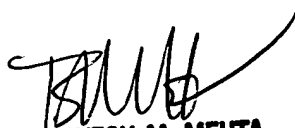
18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig W. Kronenthal whose telephone number is (571) 272-7422. The examiner can normally be reached on 8:00 am - 5:00 pm / Mon. - Fri..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Craig Kronenthal
May 3, 2006


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